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Agenda Item: 6A
Meeting Dates: August 11, 2005

CALFED SCIENCE PROGRAM LEAD SCIENTIST AND ENVIRONMENTAL WATER ACCOUNT AGENCIES[1] JOINT RESPONSE TO 2004 ENVIRONMENTAL WATER ACCOUNT TECHNICAL REVIEW PANEL REPORT

(See Attached)

[1] EWA agencies are the California Departments of Water Resources (DWR) and Fish and Game (DFG); U.S. Department of the Interior, Bureau of Reclamation (USBR) and Fish and Wildlife Service (USFWS); and U.S. Department of Commerce, National Marine Fisheries Service (NMFS).

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Introduction

The CALFED Science Program Lead Scientist (Lead Scientist) is responsible for evaluating the Environmental Water Account (EWA) each year. The Lead Scientist assembled an EWA Technical Review Panel (Panel) of independent technical experts to conduct a review each year, with the charge of evaluating the scientific information supporting water acquisition and protective fish action decisions. In the final year, the Panel evaluated the first four years of EWA and continuation of EWA. The Panel charge was to evaluate the logical and scientific merits of implementing EWA, but not to provide a recommendation whether EWA should continue. The Panel met for the last time in November 2004, and provided its report to the Lead Scientist in January 2005. The Lead Scientist and EWA agencies[1] have prepared a joint response to the Panel's report.

The Panel acknowledged continuous progress in water supply reliability and acceptable fish protection, reduced political conflict, water acquisition, communication, documentation, and specific areas of scientific investigation and science-based management. The Panel acknowledged recent improvement in understanding of delta smelt and Chinook salmon ecology, water operations modeling, and the CALFED Science Program Proposal Solicitation Package (PSP).

The Panel's greatest concern was the need for EWA agencies to expand the research base and upgrade the quality of science that underlies EWA program decisions. The Panel anticipates that if some EWA funding shifts from public to private sources, those stakeholders asked to help pay will demand more evidence that the program is meeting the objectives of species protection and recovery. This document outlines the commitment of the CALFED Science Program and EWA agencies to implement actions that will provide information to help address the concerns and suggestions in the Panel's report.

The Panel recommended ways to improve the EWA implementation and review process, including using and interpreting operations gaming; using and interpreting fish, climate and salmon mortality models; obtaining model peer review; initiating new research; expanding the review audience; increasing interaction with the Panel during the review; reducing frequency of reviews; and re-evaluating the role of the Science Advisors. The Lead Scientist and EWA agencies are responding to each suggestion by describing an action, a goal, a timeline and commitments from the Science Program and agencies to achieve the goal. This response addresses the Panel's suggestions generally in the same order as were discussed in the Panel's report.

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[2] EWA agencies are the California Departments of Water Resources (DWR) and Fish and Game (DFG); U.S. Department of the Interior, Bureau of Reclamation (USBR) and Fish and Wildlife Service (USFWS); and U.S. Department of Commerce, National Marine Fisheries Service (NMFS).

The original Panel completed its assignment and formally resigned. The Lead Scientist will assemble a new panel with a slightly different structure and a slightly different charge. Some former members may be among the new panel members. The Panel recommended, and the agencies concur, that EWA review frequency occur biennially rather than annually; therefore, EWA agencies will organize an EWA workshop for fall 2005, but not a formal review. Several Panel members may be invited as appropriate.

Purpose of Panel Review

The Lead Scientist is responsible for evaluating EWA at the end of every water year. To meet this obligation, the Lead Scientist assembled a standing panel of technical experts (EWA Technical Review Panel) who have not been involved in the EWA implementation. Panel reviews in each of the first three years focused on: (1) the scientific information underlying actions taken; (2) the incremental changes in the way decisions were made; and (3) the technical basis for those decisions. In contrast, the Year-4 review focused on two topics: (1) the first four years as a whole; and (2) continuation of EWA. As in previous reviews, the 2004 review focused on technical aspects of EWA planning and implementation.

The Panel met from November 8 through 10, 2004. The purpose of this independent review was to evaluate and comment on: (1) technical basis of results and conclusions from EWA operations over the first four years; (2) technical information and tools applied in planning for EWA program continuation; and (3) science priorities and commitments proposed for the continuing EWA program (Attachment 1). The review was not intended to yield judgments about the success or failure of the EWA program, or to obtain a recommendation on whether EWA should continue past Year 4. The Panel submitted its observations and suggestions to the Lead Scientist and the California Bay-Delta Authority (Authority) in a report dated January 17, 2005 (Attachment 2). This document constitutes a joint response to that Report from the Lead Scientist and EWA agencies (DWR, DFG, USBR, USFWS, and NMFS).

Positive Findings

The Panel acknowledged continued improvement in the areas of: (1) assuring water supply reliability while providing an acceptable level of fish protection, (2) reduced conflict between agencies and stakeholders related to water management, (3) water acquisition, (4) program documentation, (5) interagency communication, and (6) some areas of scientific investigation and science-based management. The Panel was encouraged by the improvement in understanding of delta smelt ecology, winter-run Chinook salmon adult spawning estimates, Chinook genetics, juvenile Chinook mortality, the use of water operations gaming, and the release of the CALFED Science Program's PSP emphasizing water operations issues.

The Panel highlighted the scientific information about delta smelt developed over the past four years, and how management has made substantial progress beyond the use of simple "take at the pumps" as the primary management criterion. Although methods

to estimate populations of delta smelt have not undergone peer review, recent investigations are developing a method for calculating population abundance estimates in the future. Because delta smelt are a Federally listed threatened species under the Endangered Species Act (ESA,) the Management Agencies (MAs), consisting of DFG, USFWS and NMFS, must consider "incidental take". However, over the last four to five years (concurrent with the implementation of EWA), the MAs also have considered such factors as apparent abundance and distribution, maturation stage, duration of spawning season, and relative vulnerability to entrainment when recommending protective actions to the Water Operations Management Team (WOMT), based on the delta smelt decision tree proposed by Nobriga and others in 2001. The new delta smelt decision process developed for the USFWS's Biological Opinion for the 2004 Central Valley Project (CVP) and State Water Project (SWP) Operations Criteria and Plan included updated information, and a tabular decision matrix in place of the former checklist-style process. The new decision process incorporates new information, defines a new "concern level" for adult delta smelt, adds clarifying footnotes for each of the tools and life stages represented in the matrix, and better represents the process of formulation of recommendations already used by the Delta Smelt Working Group. The new decision process formalizes recent management policy, which is to pro-actively manage to reduce population effects and implement measures intended to minimize incidental take, rather than responding to situations where incidental take has reached levels requiring re-initiation of Section 7 ESA consultation.

Improving EWA Review and Implementation Process

The Panel suggested ways to improve both the review and the implementation of EWA. Responses to those suggestions are provided below. In each case, the Panel's suggestion is followed by an action or actions to be taken, the goal of that action, the timeline in which we expect to attain the goal and commitments from the agencies and the CALFED Science Program to achieve the goal. This response thus forms the framework of a plan to address the important issues identified by the Panel, with the overall goal of increasing the efficacy of EWA.

Use and Interpretation of Gaming (Suggestion 1). The Panel identified the water operation gaming as a powerful modeling tool, as long as the process is transparent and rigorous. It recommended incorporating more biological information and treating uncertainty explicitly.

A. Action: Document gaming objectives clearly. Set up a technical panel of outside experts on modeling, gaming, ecosystem dynamics, risk assessment and fish biology. Team this panel with appropriate agency scientists/managers familiar with EWA and the broader water operations system.

B. Goal: Expand gaming to include a more rigorous biological basis, and include uncertainty/probability distributions in decisions for any future long-term EWA.

C. Timeline: Establish a schedule needed for actions on decisions for any future long-term EWA.

D. Commitments: CALFED Science Program: Establish and fund technical experts. EWA agencies: supply staff participation, organization and logistics.

II. Interpretation and Use of Models. The Panel was concerned that there was insufficient, and in some cases, inappropriate use of models to design and size EWA. Despite previous Panel recommendations, the hydrodynamics and Particle Tracking Model (PTM) were not used in planning or real-time operations. The biological models that were used were overly simplistic and lacked biological basis.

A. Fish Population Models (Suggestion 1)

1. Action: The CALFED Science Program PSP called for research supporting development of specific models, including those related to delta smelt and salmon. If approved by the Authority, some of these proposals will be funded in 2006. EWA agencies will continue developing the Delta Smelt Decision Matrix. EWA agencies will continue to support the Interagency Ecological Program (IEP) and other researchers attempting to develop population estimates and models for delta smelt and encourage their submission for peer review and external assessment.

2. Goal: Establish accepted, peer-reviewed model(s) that can be used in informing EWA decisions through modeling population-level effects of water operations.

3. Timeline: Fund CALFED Science Program PSP proposals in early 2006 related to modeling, and a workshop in Fall/Winter 2006 to examine progress of modeling efforts.

4. Commitments: CALFED Science Program: Fund CALFED Science Program PSP proposals as approved by the Authority, and facilitate workshops on delta smelt models with emphasis on developing the framework for ecosystem-level models encompassing delta smelt population effects. EWA agencies: Supply staff participation in workshops, and incorporate modeling into decision making. The Science Program and agencies will develop a protocol for improving the efficiency and use of the PMT.

B. Climate Change Scenarios (Suggestions 2 and 4)

1. Action: Coordinate with ongoing modeling by DWR (Mike Floyd) and USGS (Mike Dettinger) to establish potential future scenarios for water operations (California Water Plan, DWR Bulletin 160 process) for flow, temperature, salinity, and other factors. This may necessitate separate workshops to discuss EWA-specific effects after future scenarios are developed. Actions will require a combination of review, workshops, technical panels and directed research.

2. Goal: Facilitate move from using historical hydrographs for planning future water management strategies to using probability distributions of future flows based on climate and watershed model projections.

3. Timeline: This is a long-term effort lasting over the next five years and will be implemented along with other efforts as appropriate.

4. Commitments: CALFED Science Program: Help coordinate efforts to identify the implications for project operations and EWA with other agencies developing climate change workshops and efforts. EWA agencies: Staff participation in reviews, workshops and research, and incorporate outcomes into long-term EWA acquisition and management decision processes.

C. Juvenile Salmonid Mortality Estimates (Suggestion 3)

1. Action: Increase monitoring of juvenile fish, including salmonid emigration and survival through the main-stem rivers and the Delta to develop better estimates of mortality throughout the system. There are additional needs for population models. This will require evaluation of the use, or expanded use, of a variety of monitoring techniques, potentially including bioacoustic tracking, Passive Integrated Transponder (PIT) tagging, coded wire tagging, rotary screw trapping, beach seining, and trawling. The Science Program initiated this effort through the sponsorship of a PIT tag seminar in 2005. The CALFED Science Program PSP selection panel recommended funding for a sonic tracking system. Establish an expert panel for salmonid monitoring technology to inform a request for directed research proposals. Future workshops will be held on potential technologies and applications, followed by a call for directed research proposals. Expansion of salmonid monitoring and research is a high priority for IEP Plus Project Work Team (PWT).

2. Goal: Establish an improved juvenile salmonid monitoring system in the main-stem rivers and the Delta to provide calibration data for models to assist in describing the effects of EWA fish actions on salmonid populations.
3. Timeline: Establish the panel for salmonid monitoring technology by March 2006. Schedule a salmonid monitoring workshop by June 2006. Fund request for directed research proposals by September 2006.

4. Commitments: CALFED Science Program establish expert panel, coordinate workshop(s) on existing salmonid monitoring techniques, and coordinate and fund request for proposals. EWA agencies: Supply staff to participate in workshop(s) and evaluate techniques. A draft proposal to develop a comprehensive monitoring plan is expected from the IEP Plus PWT in early 2006.

D. Peer Review of Models (Suggestion 5)

1. Action: Peer review of all models, decision trees, gaming, etc. Modeling should be scoped and constructed to answer specific questions and incorporate and describe uncertainty. Models will be subject to external peer review. Approaching the California Water and Environmental Modeling Forum for advice or assistance is an option; another is funding post doctorates to work with agency scientists to prepare models and decision trees for publication in the peer-reviewed literature, to ensure acceptance by both agencies and stakeholders.

2. Goal: Have all models that are used for management decision making be peer reviewed and available to the public.

3. Timeline: The CALFED Fellows Program cycle is complete for 2005, but it will be available each year with a closing date about mid-May. Agencies should write a proposal for one or more of these post doctorates. Review of specific models could be done via panels, etc, and will need to be developed with agencies to fit into timing of other work/decisions. This should be started as soon as staff and resources allow.

4. Commitments: CALFED Science Program: Facilitate peer review of models. EWA agencies: Supply staff to participate in review process, and incorporate outcome into management decision making.

E. New Research (Suggestion 6)

1. Action: Expand directed research on biological questions related to EWA and increase collaboration between agency scientists and academic scientists to work on these questions. The CALFED Science Program PSP is nearly complete and includes several projects that address EWA issues. Agency scientists are among those who applied for funding through the CALFED Science Program PSP; EWA agencies will work collaboratively with the CALFED Science Program and its grantees in the development of a body of work that further supports the technical basis for resource decisions. The Science Program has also released a call for proposals for post doctorates and research assistants to work on CALFED problems. The IEP Pelagic Organisms Decline (POD) PWT will continue the investigation of reasons for the decline in pelagic organisms in the estuary, including a possible linkage to increased Delta exports.

2. Goal: Incorporate more of the results of directed research into EWA decision process. This will require better and more detailed analysis of existing data sets driven by models and hypotheses. Improve access to and expertise with the PTM and expedite distribution of results.

3. Timeline: CALFED Science Program PSP grants will be out in early 2006; post doctorates will be supported in September 2005 and each year after for five years. The IEP POD PWT research will continue to focus these studies to assess cause and effects, identify potential immediate results, create a directed research proposal including budget for 2006, and initiate a proposal for longer-term program needs. It is anticipated that substantial additional funding will be sought for 2006 and beyond, with the potential to provide information in a very timely manner.

4. Commitments: The CALFED Science Program will fund approximately $6-10 million of new research starting in 2006. Much of that work is related to water operations and fish populations as approved at the August 2005 Authority meeting. EWA agencies: Supply staff to participate in the IEP POD PWT.

III. Improving the Review Process. The Panel recommended some changes to EWA review process to strengthen and improve future reviews with a new panel.

A. Include Broader Audience and Better Dialog with the Panel (Suggestions 1 and 2).

1. Action: The Science Program will establish a new review Panel and request assistance from the new Panel members in the development of the agenda/charge/organization of the review. Continue posting meeting notices, meeting summaries and technical material on the CALFED website in a timely manner. Provide more opportunity for non-agency scientists to present data/models/interpretations to the Panel and to be included in the primary record of the review process. More interaction is needed among the Panel, Lead Scientist and Science Program, and EWA agencies' staff during development of the review (all aspects including materials, format, timing, participants, etc.).

2. Goal: Get a broader perspective on the outcome of EWA decision-making and science needs, and allow the Panel to use its expertise to drive the review process.

3. Timeline: Next formal EWA review in fall 2006, or when the long-term EWA program proposal (draft EIR/EIS) is available.
4. Commitments: CALFED Science Program: Facilitate communication among Panel, CALFED Science Program, and EWA agencies. EWA agencies: Increase level of staff participation and communication with Science Program and Panel.

B. Formalize the Response to the Panel (Suggestion 3)

1. Action: The CALFED Science Program will formalize the response, and make it a permanent part of the review process. The CALFED Science Program will foster a joint response by the Lead Scientist and EWA agencies. The response will provide information regarding the capacity of EWA agencies and Science Program to respond to the Panel's review, clarify any information the Panel may have misunderstood, and identify topics on which EWA agencies/Science Program and the Panel disagree.

2. Goal: Establish a mechanism for provision of a joint response within 3 to 6 months of the issuance of the EWA review.

3. Timeline: Beginning with this response to the 2004 Technical Review and continuing in future years.

4. Commitments: CALFED Science Program: Dedicate staff. EWA agencies: Dedicate staff; provide presentations to the Panel and Authority, including response to Panel recommendations.

C. Revised Review Process (Suggestion 4)

1. Action: Change the review period from annual to biennial, to allow more progress on key science issues between reviews and better preparation for the review. Use a smaller Panel and incorporate stakeholders into the biennial review process. Change balance of expertise among Panel members to include more biological/ecological and engineering scientists and fewer social scientists. In the off years, certain Panel members may be invited to participate in EWA-related workshops and become more involved in other EWA activities, to keep them informed of key issues and results. For example, this year Jim Cowan participated in a predation workshop.

2. Goal: Make the review process more responsive to broader issues rather than reporting incremental changes in information.

3. Timeline: Begin planning in 2005 to implement the new review process for the 2006 review (two years after the 2004 review).

4. Commitments: CALFED Science Program: Facilitate incorporating broader EWA issues, focus on key science issues, fund workshops and Panel members to participate in EWA activities or workshops. EWA agencies: Participate in review, and develop substantive material for review.

D. Role of the Science Advisors (Suggestion 5)

1. Action: Clarify the role of the Science Advisors and their interaction with Panel and the EWA agencies. This will require a change in the charge to the Science Advisors and possibly a change in Science Advisors that will be developed by the Lead Scientist to address important unknowns in the science related to EWA management.

2. Goal: Define the detailed role and level at which the Science Advisors will offer independent evaluation and analysis of data associated with EWA fish actions or science needs for the CALFED Science Program.

3. Timeline: Before the scoping for the next EWA technical review begins, preferably by early 2006.

4. Commitments: CALFED Science Program: Provide staff and clarify role of Science Advisors. EWA agencies: Provide staff and input into the role of Science Advisors.

Increased Scrutiny

The Panel believes that if EWA becomes a long-term program and some of its funding shifts from the public sector to specific water user groups, then stakeholders who are asked to pay will require evidence that the program is meeting its stated objectives of protection and recovery of threatened and endangered species and other at-risk species. The CALFED Science Program and EWA agencies acknowledge that this increased scrutiny will occur, and that future evaluations must focus on providing credible evidence of success in protecting and restoring threatened and endangered fish species. Many factors have contributed to the decline of the Bay-Delta system and the CALFED agencies have pursued restoration efforts that are intended to positively impact more than one stressor, rendering the differentiation of the effects of individual restoration projects problematic. EWA has been used primarily to reduce the effect of entrainment at the SWP and CVP export pumps, and EWA agencies acknowledge that it has been difficult to quantitatively assess these effects. The Panel also recognizes that it is difficult to distinguish the EWA effects from that of other environmental restoration programs being implemented. Performing a thorough science-based assessment of EWA will require EWA agencies to allocate additional resources, including dedicating sufficient staff time to perform the analyses and providing access to the services of biometricians and other specialists, to assist, advise, and bridge any gaps in agency expertise. Actions by the Science Program and EWA agencies described elsewhere in this document, if they can be implemented, also will help provide the means to conduct the type of assessment that the Panel, the Science Program and EWA agencies agree is needed.

Biological Consequences of Water Purchases

In prior reviews, the Panel recommended evaluating both the benefits and costs to the environment of EWA actions to maximize the net benefit to listed species. A similar comment from the Panel in 2004 focused on water purchases. Effects may occur in the Delta or in aquatic ecosystems upstream.

For example, the transfer of EWA water from the north, through the Delta, to the export service area may have positive effects in the stream of origin and negative effects in the Delta. Such transfers typically occur during the summer months when the requisite hydrological conditions prevail. Fish impacts are presumed to be minimal because few salmonids are present and other species, including delta smelt, are located in the western Delta and not vulnerable to entrainment as the transferred water is re-diverted in the south Delta. The recently prepared "Interagency Ecological Program 2005 Workplan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary" (May 25, 2005) identifies water project operations, including higher summer export pumping, in a conceptual model of general factors that may be acting individually or in concert with other factors (toxins, invasive species) to lower pelagic productivity. A screening level study in 2005 will try to better define the degree to which each of these factors may be responsible and guide priorities for future use of program funds and resources. Depending on the results of the IEP POD PWT investigation, a number of CALFED program elements, including EWA implementation, may need to make adjustments to current plans and practices.

The Panel implied that purchases in the export area would be preferable to purchases from sources upstream of Delta. It should be noted that some of the water available to be purchased in the export service area was exported from the Delta initially, so not all export area purchases will result in avoiding the Delta export impacts associated with upstream of Delta purchases.

Another example of an EWA action that may have unintended consequences is obtaining water from the Delta for the EWA by pumping more than the export:inflow (E:I) standard in the 1995 Bay-Delta Water Quality Control Plan when that standard limits SWP/CVP pumping. Pumping above the allowable percent of inflow, at the discretion of the fish agencies, provides the EWA with water south of the Delta at relatively low cost (power to operate the pumps). It was done in the past only when relatively few fish were being entrained. EWA agencies have recently reconsidered use of E:I standard flexibility in the spring months primarily due to the potential for adversely affecting delta smelt larvae that are too small to be observed in the Delta or counted in fish facility samples and the possibility that the harm to delta smelt while obtaining water this way is greater than the benefits for delta smelt from EWA actions taken at another time using this water. Unless information is obtained that indicates this concern is not warranted, this method of obtaining EWA water may be used infrequently in the future.

EWA agencies try to purchase water from upstream sources such that in-stream habitat values can be enhanced when the water is released and conveyed to the Delta for export. Location of willing sellers and constraints on when EWA water may be

transferred through the Delta limit this type of benefit from EWA transactions. It is important to note that, while EWA agencies are actively seeking opportunities to maximize the benefits by releasing purchased water from reservoirs upstream of the Delta at times when instream uses are important, rarely has EWA water been used solely for instream purposes. Fall temperature control actions to improve spawning conditions on the lower American River involved purchases of power rather than water. Some fall reservoir releases (e.g., Merced River and lower American River) have been timed to yield instream flow benefits, but the water was released knowing it would be recaptured in the Delta and delivered to the Projects to repay the cost of export pumping curtailments at other times.

Despite our best efforts, unanticipated events can sometimes preclude intended uses of EWA water. In 2004, due to unforeseen circumstances (seller provided water later than planned, rules for use of b(2) water established base case flows for EWA accounting purposes that precluded release of EWA water, unacceptable impact of increasing pumping on south Delta water levels) 15.4 thousand acre-feet (TAF) of 18.7 TAF of EWA water purchased on the American River was released in the lower American River to provide instream benefits, when it was recognized that the water could not be re-diverted in the Delta. The remaining 3.3 TAF was displaced from Folsom Reservoir when the reservoir reached the maximum allowed storage and USBR initiated flood control operations on February 1, 2005. In the future, EWA agencies will continue to try to achieve the maximum benefit possible from EWA water purchases and minimize the unproductive disposition of EWA water. We also will adjust our practices if new information warrants change.

Program Integration

As in previous reviews, the Panel recommended further program integration using a systematic approach. They were encouraged by the conceptual agreement to integrate the IEP with the CALFED Science Program. They still believe there are opportunities to more fully integrate the several environmental water programs and the Ecosystem Restoration Program. As presented at the EWA Workshop and for EWA Technical Review, EWA agencies presently coordinate environmental water planning across programs, principally through the WOMT, the B2 Interagency Team (B2IT) and the CALFED Operations Group. Since the 2004 EWA Technical Review, an additional team, the Interagency Water Acquisition Group, has been formed by the USFWS and meets as needed to coordinate purchases of water for environmental purposes, such as instream flow augmentation and wildlife refuge water supplies (CVP Improvement Act Level 4 requirements). These programs should be and are implemented in a coordinated fashion, but cannot be fully integrated or consolidated given the differing mandates, water sources, funding, and purposes of the various environmental water programs. EWA agencies believe that, to the extent possible, program integration and coordination of planning is presently occurring and that opportunities for synergistic coordination will continue to be evaluated and implemented in the future.

Conclusion

The Science Program and EWA agencies appreciate the efforts of the Panel and commend its dedication to improving the scientific foundation for the EWA program. We intend to follow through on the Panel's recommendations to the extent practicable, given current and foreseeable levels of funding and staffing. The Science Program and EWA agencies look forward to further improvement through continued evaluation in cooperation with a new Panel, to be convened in 2006. Our goal is to ensure that EWA contributes to a multi-objective, long-term water management strategy for restoration of the Bay-Delta system.

List of Attachments

Attachment 1 – Charge
Attachment 2 – Report

Contact

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Charge for 2004 EWA Technical Review Panel

The Lead Scientist for the CALFED Bay-Delta Program is responsible for evaluating the Environmental Water Account (EWA) at the end of every water year. To meet this obligation, the Lead Scientist assembled a standing panel of technical experts (EWA Technical Review Panel) who have not been involved in EWA implementation.

EWA Technical Panel reviews in each of the first three years focused on: 1) the scientific information underlying actions taken, 2) the incremental changes in the way decisions were made, and 3) the technical basis for those decisions. In contrast, the year-four review will focus on two topics: the first four years as a whole, and continuation of the EWA. As in previous reviews, the 2004 review will focus on technical aspects of EWA planning and implementation.

The purpose of this independent review is to evaluate and comment on: 1) the technical basis of results and conclusions from EWA operations over the first four years, 2) the technical information and tools applied in planning for EWA program continuation, and 3) the science priorities and commitments proposed for the continuing EWA program. This review is not intended to yield judgments about the success or failure of the EWA program, nor to obtain a specific Technical Panel recommendation as to whether the EWA should continue past year four.

Before and during the November 2004 workshop, the EWA Technical Panel will receive written reports and oral presentations from the management (DFG, USFWS, and NOAA-Fisheries) and project (DWR and USBR) agencies, and from the Lead Scientists or his advisors. All of this information will provide input to, but not constrain, panel deliberations.

I. Charge for review of the first four years of EWA implementation

The Panel's charge is to evaluate and comment on the technical information, analyses, results, and conclusions from the first four years of EWA implementation. The Panel should consider these results and conclusions given the program goals, the tools for analysis and decision-making, and the constraints imposed by regulations, resources, and methods of acquiring and using water. Specific questions the panel should consider, include:

- Does the information, results, and conclusions presented provide a thorough understanding of EWA effects on water supply, water project conveyance and yields, and the water transfer market? If not, what other information and analyses are needed?

- Does the information, results, and conclusions presented provide a thorough understanding of EWA effects on individuals and populations of at risk fish species? If not, what other information and analyses are needed?
- Has the information and knowledge of EWA effects made its way into the subsequent use of water assets to protect at risk fish species?
- Are the agencies' showing good progress in responding to previous Panel recommendations?
- Are the efforts to coordinate and integrate EWA with other programs increasing the ability of EWA to achieve its goals? If not, what additional efforts does the panel recommend the agencies pursue?
- What uncertainties and limitations remain in understanding the effects of the first four years of EWA implementation?

II. Charge for evaluating EWA program continuation

The panel is asked to evaluate and comment on the appropriateness and adequacy of: 1) the technical tools and information used in planning for the continuation of the EWA program, and 2) the science priorities and commitments proposed for the continuing EWA program. Specific questions the panel should consider, include:

- Are the agencies using technical tools (e.g., models, analytical and assessment techniques) that are appropriate and adequate for developing detailed and informed proposals for a longer-term EWA program? If not, what additional technical tools are recommended?
- What are the priority questions and issues that should be addressed in the next three years to help inform decisions about the features and scope of a longer-term EWA?
- Will the science priorities and commitments for research and monitoring proposed by the implementing agencies improve our abilities to evaluate the effects of a continuing EWA program?
- Are the science practices and principles proposed for the continuing EWA program sound and sufficient? If not, what additional practices and principles are recommended?
- Are there additional considerations or uncertainties that should be addressed to ensure the agencies obtain and use the information necessary to making informed decisions about a longer-term EWA program?

Review of the 2003-04
Environmental Water Account (EWA)
Submitted by the 2004 EWA Review Panel
Submitted: 1/17/05

Introduction

The fourth annual meeting to review the Environmental Water Account (EWA) convened on November 8-10, 2004 at the Bay-Delta Authority office in Sacramento, California. The EWA Technical Review Panel (Panel), as charged by CALFED's Lead Scientist, was assembled for the fourth and final time. In contrast to the first three years of reviews, the fourth year review focused on two topics: the first four years as a whole, and proposals for a long-term EWA. As in previous reviews, the 2004 review also focused on technical aspects of EWA operations and actions. The ten members of the 2004 review Panel are listed in Appendix 1.

The 2004 review focuses on the future of the EWA as it is poised to move beyond the initial "experiment", and become a more permanent management tool. Written documents that described the fourth (2003-2004) year's activities were distributed and reviewed by the Panel prior to the annual review, and additional materials were received during the review. Materials provided to the Panel after the review meeting were not considered in this report. At the annual review meeting, oral presentations by both agency participants and stakeholders provided important additional information that supplemented the written documents. Following the public presentations and discussions, the Panel met to discuss and evaluate the 2004 EWA operations and to evaluate the progress made in implementing previous Panel recommendations. The Panel drafted a preliminary set of findings and recommendations that serve as the basis for this report, and orally summarized these findings to the meeting participants and the public on Wednesday November 10, 2004. An exchange of comments and questions from the public, stakeholders, and agency personnel followed the Panel's presentation. Those comments and the written documents are considered in this report.

The Panel recognizes that the EWA is moving into a new phase as a tool for long-term ecological water management. The most compelling issue facing managers if EWA is to be a "science based" program is the challenge of expanding the research base and upgrading the quality of the science underlying program decisions. Although the Panel sees the current status of the science in support of EWA as a potential Achille's heel of the program, the Panel also recognizes the budgetary and other constraints on personnel and resources that have limited CALFED's ability to mobilize new resources to address the science needs of EWA. Additional monetary and staff resources will help to address the many science issues facing EWA, but the Panel encourages the managers to consider the more cost effective approaches suggested in this, and the previous three, EWA review reports in the event that proposed funding increases are limited or do not materialize.

The Panel also wishes to acknowledge the efforts of the scientists and managers "in the trenches" that have analyzed data, participated in gaming exercises, attended workshops and meetings, prepared annual reports, and addressed some of the many science needs of EWA in spite of the lack of additional support. Their dedication and efforts have provided the foundation for the viability of EWA as a long-term water management tool.

This year's report is organized as follows. We begin with the many positive findings and accomplishments of the program to date. We then discuss some ways to improve the scientific basis and the review process of a long-term EWA program.

Positive Findings for EWA 2004

The fourth year of the Environmental Water Account (EWA) demonstrated continued improvement and progress in several noteworthy areas that are highlighted below.

- The EWA has done an effective job of assuring water supply reliability to the water contractors, while concomitantly providing an acceptable level of fish protection. The level of fish protection achieved is likely at a higher level than could have been attained by fixed standards. The EWA agencies have taken actions they believed would protect and restore at-

risk native fish populations in the Bay-Delta at no uncompensated water cost to export Project contractors south of the Delta, beyond those reductions required under the regulatory baseline of the CALFED ROD.

- As an experiment in organizational and management policy change, the EWA is unquestionably successful. Agencies and stakeholders feuding over how to protect endangered fish now work together in real time collaborations to provide water for fish protection. Management agencies better understand the perspective and the needs of operating agencies and the operating agencies are more cognizant of fisheries needs. Further, the relationships between the representatives of water contractors, including farmers and environmental groups, appear be on an improved footing. Additional review of conflict reduction in a broader context is included later in this report.

- As has been the case since the beginning of the EWA, the Panel believes that the acquisition of water for the EWA continues to be one of the more effective elements of the program. Despite the technical and political complexity of acquiring environmental water in a timely and economic manner, the process continues to function smoothly. There is also evidence that managers look for ways of optimizing environmental benefits through careful timing of releases and other actions. The careful descriptions of the rationale for acquisition primarily north of the delta, the pumping capacity limitations on timing of water shipments, and the difficulties imposed by annual-only transactions are examples that helped the Panel understand the intricacies and admirable efforts being undertaken in the water acquisition aspect of the EWA.

- Since the inception of the EWA Review Panel process, the Bay-Delta Authority and agency personnel have produced a substantial written record of documents for review by the Panel prior to its annual meeting. During this time period of limited personnel resources, the continued preparation of timely documentation is noteworthy and indeed an accomplishment. The perspectives provided by environmental and other stakeholder groups have been valuable in past reviews and we hope that such written comments will continue to be provided in the future.

- Communication and coordination has been an area of significant progress since Year 1 of the EWA. The weekly meetings of the EWA Team, the (b)(2) Interagency Team, the Data Assessment Team, and the Water Operations Management Team have continued to evolve in a positive direction. The ability to make timely, reasonable decisions in the presence of scientific uncertainty has become one of the hallmarks of the EWA program.

- Since the inception of the EWA there have been areas of scientific investigation and science-based management of particular note. One area has been the continuing advancement of understanding of Delta smelt ecology and incorporation of this information into models. This understanding has led to recent constructive scientific debate of alternative hypotheses of the Delta smelt life cycle and the importance of temporal and spatial variation in life stage specific mortality rates.

- An additional notable area has been the improvement in winter run salmon spawning estimates and the resulting effect on the estimation of the juvenile production index. In addition, the multi-agency, multidisciplinary investigations of salmon distribution and mortality at the Delta Cross Channel have been a component of the recent success in avoiding 'red light conditions'. These improvements, and others such as explicit incorporation of water quality concerns, are considered annually in changes to the salmon decision tree and show evidence of close coordination and refined thinking about the best deployment of EWA resources.

- While the Panel did not hear a report at the review workshop concerning the genetics work aimed at identification of true winter run chinook salmon, a written summary of that work suggests substantial progress in refining identification of "genetic" winter run. The work seems to be leading managers to a re-evaluation of the timing, size criteria, and salvage mortality for winter run fish that could have consequences for pumping curtailments in the future. As the results of this and other new findings unfold, a rapid feedback between new research and consideration of potential management changes will heighten the effectiveness of the EWA.

- This year's report on the possible effect of EWA actions on winter run salmon mortality was an interesting and useful exercise. Two items of particular note were important. First, the report

found that with four different models that incorporated various sources of mortality and assumptions of relationships, the net improvement of salmon survival was about the same and small. Second, the report brought out the important finding that transfers of EWA water itself are a source of some mortality and, potentially in some years, could offset some of the gains from pump curtailment. This exercise was another example of the value of models and comparing alternative models that should spark additional investigation and refinement of the EWA and how one assesses the biological benefits of water management. Additional detailed comments, cautions and suggestions for improvement on these models are provided later in the panel report.

- Integration and communication between each of the environmental water programs (EWA, EWP, CVPIA (b)(2), and CVPIA WAP) has increased based upon both written material reviewed by the Panel and the presentations at the workshop. This year's EWA Review Panel workshop also included for the first time a presentation and discussion of the Ecosystem Restoration Program (ERP) and its relationship to the EWA. Increased collaboration between these two CBDA environmental water programs is critically important, because the science supporting both programs is inseparable. Although the ERP has yet to exercise its own authorized water purchase element, future implementation should further unite and expand the coordination of these two programs.

- One of the most encouraging steps in the organization of Bay-Delta science has been the conceptual agreement to integrate the Interagency Ecological Program into the Bay-Delta Authority's Science Program. For more than three decades, the IEP has developed and maintained the many monitoring programs that have made this one of the most data-rich estuarine systems in the United States. The IEP also has supported extensive problem-oriented investigations. The functional integration of IEP with the Science Program should not only bring about a mutually beneficial coordination of resources, but a greater transparency to how issues are prioritized and how decisions are made. How IEP monitoring priorities and support are meshed with the Science Program is of continuing interest to the Panel.

- Gaming was originally used as a tool to conceptualize, structure, and quantify the EWA program in the months preceding the ROD. In the past year, gaming and models were used to examine future EWA needs based on application of the existing decision tree criteria. The idea of using applicable gaming techniques, reasonable assumptions, and appropriate models to explore the long-term EWA program has substantial merit and should continue to be pursued. In a later section, the development and application of gaming and models for this purpose is discussed in additional depth.

- The issuance of the Science Proposal Solicitation Package (PSP) that will promote the expansion of applied scientific investigations in the Bay-Delta system. The recently-issued Science PSP will generate proposals that will include rigorous peer review and thus the research will be likely to produce high quality scientific information. The Panel understands that there may be some ability to tailor the call for specific research needs of the EWA in forthcoming Science PSPs. The ability for both general calls for proposals and tailored calls for proposals to address specific needs is a welcomed development. This flexibility, while maintaining the highest standards of peer review, addresses a need expressed by the Panel since the beginning of our reviews.

- Scientific information about Delta smelt has increased dramatically over the past four years. In particular, recent investigations have supported the transition from dimensionless indices to population abundance estimates. New insights have been incorporated into alternative models. Alternative models of Delta smelt populations have also fueled critical and creative thinking about the life cycle and the alternative hypotheses that can be tested. This cycle of increasing knowledge is forming the basis for more effective management.

- The management of Delta smelt has made substantial progress in moving away from simple take at the pumps as the primary management criteria. Management has incorporated the use of geographic distribution of the population, actions to avoid entrainment zones, and an increased understanding of relative vulnerability of different life stages to entrainment.

- As understanding Delta smelt life history has improved, the new information has been incorporated into updates and revisions of the decision tree. This rapid feedback link to management is particularly noteworthy and has been critical for maximizing benefits of restoration actions and for shaping future monitoring and research questions.

Systematic Approach to Program Integration

Several of our prior Panel review reports have emphasized the opportunities for and the importance of integrating the EWA with other environmental water tools in the CALFED arsenal. As we noted in our second annual report, for example, the Ecosystem Restoration Program (ERP) and the EWA share a common biological goal of protecting and enhancing listed fish species. Although the ERP and EWA are designed to reach these goals through different mechanisms (habitat creation and management in the case of the ERP versus flow manipulation in the case of the EWA), the two programs can increase their biological effectiveness by coordinating their activities. The overall effectiveness of the CALFED program also depends on the degree to which the EWA coordinates with other water assets available for Delta improvement. These assets include (b)(2) water, the Environmental Water Program (EWP) of the ERP, and the CVPIA Water Acquisition Program (WAP). A 2001 briefing paper for the EWP listed a number of important means by which the EWA and the EWP could work together in the acquisition and use of water resources.

A great deal of valuable coordination has already taken place. The managers of the various programs meet with each other and discuss opportunities for coordination. The CALFED program often uses (b)(2) and EWA water conjunctively to reduce pumping operations, with the EWA water being used to reduce pumping at the State Water Project while (b)(2) water is used to reduce pumping at the Central Valley Project. The management agencies also have looked for ways of using EWA water to simultaneously reduce take at the pumps and achieve other fishery benefits such as increased flows in upstream areas and decreased water temperatures.

The CALFED program, however, does not appear to have taken maximum advantage of integration opportunities. Some of the explanations for not fully attempting to integrate are specific to how individual water programs have progressed. For example, lengthy delays in starting up water operations under the EWP have postponed potentially valuable integration between the EWP and the EWA. More importantly, the management agencies do not appear to have taken a systematic approach to integrating the various environmental water programs. Integration to date has taken place on a largely case-by-case, opportunistic basis. To ensure that they are achieving the maximum benefits from integration, the management agencies should engage in a careful planning process in which they identify all opportunities for integrating the EWA with other environmental water tools; analyze the potential advantages, tradeoffs, and risks of using the EWA in each such setting; and establish operational guidelines for when integration should take place.

The CALFED program also should better integrate its evaluations of the various environmental water tools at its discretion. Because the EWA focuses on actions designed to reduce "take" at the pumps, efforts to evaluate the EWA's contribution to the protection and restoration of listed fish species provides, at best, a partial picture. The benefits of EWA-specific actions cannot be fully evaluated without considering the benefits and actions of the other environmental water tools at CALFED's disposal, the overall effectiveness of all of the tools, and the opportunities for synergistic coordination among the various tools.

Biological Consequences of Water Purchases

In our prior annual review reports, this Panel has recommended that the management agencies consider the environmental benefits and costs of all of the EWA's various water operations in order to maximize the net benefits to listed fish species. The management agencies appear to be doing a good, although relatively ad hoc, job of doing this in deciding when and how to use the EWA's water assets. The EWA, for example, has released water upstream in various situations to increase flows or lower water temperatures during critical periods.

CALFED should also consider the biological consequences of its water purchases. Decisions regarding where, when, and how to acquire water can have consequences for listed fish species. Water that is purchased north of the Delta, for example, must be transported through the Delta in order to be of value in offsetting curtailments in pumping operations. The movement of EWA water through the Delta can have both negative and positive consequences to listed fish species, and EWA managers should consider these consequences in deciding whether and when to buy water north of the Delta. Although CALFED might already factor such considerations into decisions regarding water purchases, we have not seen information that this is being done on a regular and systematic basis.

Increased Scrutiny

The Panel believes that heightened program scrutiny is likely in the future and that the issue deserves further consideration in this year's report. In last year's (2003) review panel report we suggested that if new funding arrangements required water contractors to share the costs of the EWA, then increased scrutiny from stakeholders would likely follow. Heightened scrutiny will eventually lead to a demand for definitive documentation that the program was meeting the intended objectives (i.e., the protection and recovery of endangered species).

The EWA was initially designed as an experimental program to be evaluated at the end of four years. The initial policy design front-loaded the inspection process by providing a venue for review and cancellation should the program fail to merit continuation. As previously noted, the EWA has largely escaped critical public scrutiny since its first year when the winter run take exceeded the maximum levels. On the basis of improved methodologies, it subsequently appeared that the populations of interest were much larger and losses at the pumps much smaller than thought at the time. Without the dramatic stories of excessive fish losses to report, newspaper coverage of the EWA has been low-key during the last three years.

Open conflict attracts attention and scrutiny, while cooperation allows programs to operate below the radar of public examination. Other causes for heightened scrutiny of the EWA, besides the threats to secure water supplies, apparently were put to rest in 2000-2001 and have

remained low. The highly visible clashes between fish agencies, water system operators, and urban and agricultural water contractors have abated. The EWA deserves credit for creating improved working relationships among stakeholders that were previously at odds. The deadline for a thorough reassessment of the EWA anticipated in the ROD to take place at the end of four years has been overtaken by events. Some form of EWA (perhaps differently financed and operated) is a critical element in the Delta Improvements Package through which increased pumping capacity will involve moving more water through the Delta to contractors in the South. At this point in time, the EWA is the price contractors may be willing to pay in order to move past the objections environmental interests might otherwise raise that the balance between development and environment promised in the ROD was not being maintained

Whether the EWA will be able to withstand greater levels of scientific scrutiny in the future depends largely on whether the program is able to provide credible evidence of success in protecting and restoring threatened and endangered fish species. The Panel perceives that a subtle shift in the burden of proof and exposure to risk may be taking place. While at a previous point in time the EWA was a vehicle to attract environmental support for a program that removed any threat of supply shortfalls from the contractors, the long-term security of fisheries protection dependent upon the EWA may hinge upon scientific proof of the program's efficacy and efficiency.

At some point in the future it seems likely that the issues of overall efficacy and cost effectiveness of the EWA will emerge. While EWA is a small fraction of overall water project costs, the program is expensive to the taxpayers and operators who may share costs. Moreover, the state is a major participant in California water markets. Because competition drives up water prices, other buyers may raise questions. The Panel continues to be concerned about the extent to which the EWA can be held accountable for contributing to fisheries recovery. Here, the degree of science underlying the EWA becomes critical. Uncertainties still exist about precisely which protection and recovery actions are important and why. As the focus of EWA actions moves away from the pumps and towards upstream actions in tributaries to affect flows and temperatures, it becomes difficult to distinguish the EWA effects from that of other environmental restoration programs within the California Bay-Delta Authority. It may be

difficult to defend the EWA program against increased scrutiny if it is not rooted in mechanistic scientific understanding.

Improving the EWA Review and Implementation Process

The following three sections address observations from the Panel on areas that may become problematic for the EWA if not addressed or that may improve the future implementation and review of the EWA.

Uses and Interpretation of Gaming

Observation: The Panel was encouraged to see continued use of models and gaming in order to explore alternative future scenarios for the EWA. The gaming has been successful in the past, and is a powerful tool for planning and ensuring that agency and stakeholder participants understand how future decisions are made. However, if the gaming is not done with the utmost level of care and transparency, gaming (and modeling in general) can also lead to improper interpretation of results and misunderstandings about the scientific basis of decisions. The Panel heard several presentations that referred to the recent gaming exercise as "sizing the future EWA" and "determining fish needs". These presentations described the questions addressed by the gaming and how the simulations were done in similar, but not identical, terms. Extreme clarity in defining the questions to be addressed by the gaming, and describing exactly how the gaming simulations are done is critical for effective gaming. Loose labeling of gaming results and loose descriptions about the details of which factors were treated as adjustable for fish needs versus externally constrained by economics or water availability will likely lead to confusion about the results by those not intimately involved in the gaming exercise. The Panel believes gaming can, and should, play an important role in providing science-based results to decision-making about the future EWA. Gaming will be most useful when careful statement of the questions and careful description of how the gaming was done accompany the gaming results.

Suggestion: Two areas for expanding, and potentially improving the gaming were noted by the Panel: inclusion of more biological information and explicit treatment of uncertainty. If it is

anticipated that the gaming will be used for understanding and projecting the water needs of key fish species, we recommend that the biological basis of the gaming be established. Information on where in the ecosystem and when during the year additional water would benefit important life stages of key fish species is becoming available, and could be incorporated into the gaming to help put gaming results on a sounder biological basis. Gaming results used for middle- to long-term projections and planning (multiple years and decades) are increasingly subject to uncertainty due to simplifications imbedded in the models and our lack of knowledge about future conditions. There are methods available (e.g., Monte Carlo simulation) that could be adapted to the gaming that would allow explicit treatment of aspects of these sources of uncertainty. The Panel supports the past and ongoing gaming as an excellent tool for multiple parties to better understand the options and limitations of water availability and ecosystem needs, and as input to science-based decision-making. Expansion of the gaming to include a more rigorous biological basis and to explicitly treat uncertainty would increase the power and utility of the gaming.

Interpretation and Use of Models

Observations: In general, the Panel feels that insufficient and in some cases, inappropriate, use is made of models to design strategies for using EWA resources or even for sizing the EWA itself. For example, models to assess the impact of pumping on salmon migration survival are overly simplistic and lack a biological basis. Another example is not utilizing existing models. Despite previous recommendations by the Panel, to the best of our knowledge, the hydrodynamics (DSM2) and particle tracking models (PTM) developed by DWR are not used in any real time fashion or *a priori* when EWA assets are being expended to evaluate what changes in Delta hydrodynamics might result from a planned action. Synthesizing particle-tracking model results with observations of Delta smelt larvae distributions would be a valuable exercise and useful for developing an adaptive management approach to asset allocation. Such modeling might also help identify which sampling locations provide the most valuable information in terms of forecasting or preventing entrainment.

Suggestion 1: As we have stated in each of our previous reviews, the Panel believes strongly that population models can play an important role in understanding the impacts of entrainment or, equivalently, the population-level benefit of preventing entrainment by EWA actions. This illustrates the valuable role that models can play in terms of synthesizing what is known and possibly providing alternative conceptual models of how a given stressor (e.g., entrainment) affects the population of a species like Delta smelt. For example, the matrix model described by Bill Bennett during the EWA review workshop suggested exports play a relatively small direct role in affecting Delta smelt populations yet exports may have a relatively large indirect effect by essentially removing the "Olympians" who survive the other perils of making it from larvae to adult.

Suggestion 2: A valuable aspect of any smelt population model would be that it could be used in conjunction with a water resources model like CALSIM as an aid to sizing the EWA. For example, it might be possible to make a forecast of what actions might be taken in response to future physical conditions (precipitation, snowmelt, runoff, water temperature) derived from various models of future climatology (van Rheenen et al 2004). Rather than only replaying the past few years of the EWA, as was evidently done recently by DWR in their effort to provide rational criteria for sizing the EWA for the near-term, this coupled modeling activity might provide a useful alternative and play a role in the gaming activities. While the DWR analysis focused on the near-term is valuable, additional analyses focused on the long-term and using alternative models would provide important information on the robustness of conclusions.

Suggestion 3: Models describing the effect of EWA actions on salmon survival need a mechanistic foundation that characterizes the diversion and movement of juvenile fish into the inner Delta where they experience increased mortality relative to migration through the mainstem of the river. Calibration of these models will require increased understanding of the effects of tides, river flows and EWA operations on fish movements. Further analysis of the Delta Cross Channel and other tracking studies and implementation of a Delta wide PIT tagging program are encouraged.

Suggestion 4: The Panel is convinced that whatever modeling is done must formally take account of the inherent stochastic variability of the forcing variables and responses of the system. For example, any modeling done to size the EWA (whatever the approach used to define when EWA water would be expended) should explicitly construct probability distribution functions of water needs based on Monte Carlo-generated sequences of hydrologic conditions with specified statistics. These sequences of possible future conditions should also try to consider including the possibility of climate change (see van Rheenen et al. 2004). In a like fashion, any modeling done for the EWA should also explicitly recognize uncertainty in the forcing variables, and more importantly, recognize the uncertainty in model structure and parameter values. Such uncertainty can be "propagated" through the model to show its effect on the model predictions, thus making clear the likely certainty of model forecasts.

Suggestion 5: All models that are used should be clearly described, and most importantly, subjected to peer review. Ideally, this should take the form of publication in the peer-reviewed archival literature. While this may seem only appropriate for academic research, the Panel notes that the recent NAS report on the Klamath River makes clear that publication with peer review is the appropriate standard by which "best science" should be judged.

Suggestion 6: It seems clear that suggestions by the Panel in past years with respect to carrying out new research that needs to be done to provide the needed scientific information have yet to bear fruit. It is equally clear that staff resources (people and expertise) do not exist within the agencies to accomplish what is needed. The Panel is encouraged by the fact that the current CBDA proposal solicitation is directed at addressing a number of the issues raised by the Panel in previous reviews. Nonetheless, the Panel recommends that CBDA institute a small program of seed proposals targeted at addressing specific issues and needs related to EWA. Responders to the seed proposal request would necessarily be composed of both agency and outside (e.g. university) scientists, and the aim of the proposed projects would be the eventual development of a full-blown proposal to the CBDA Science program. Unlike what has often been the case with agency science funded to date, the proposed work that resulted from this effort would be itself subject to peer review before funding in order for the full-scale work to proceed, and should be

subject to any other conditions (e.g. documentation, products that are delivered on an agreed to schedule, etc.) CBDA imposes on its grantees.

The purpose of this seed program would be to take advantage of the enormous base of system knowledge and expertise resident in the agencies, while also drawing on the expertise and skills of outside scientists unavailable inside the agencies. Moreover, the participation of agency personnel will help make sure that the results of the work are appropriate to the agencies' needs. This seed program also reflects the realities that: (a) the formulation of experiments aimed at providing the knowledge needed for the EWA requires a significant investment of time by interdisciplinary groups of scientists; and (b) this investment will not happen unless resources (i.e. funds) to support the efforts of people inside and outside the agencies are made available. In a sense, what we propose can be viewed as an extension of awarding points in the PSP review process for collaborations.

Improving the EWA Review Process

In this our fourth and final EWA review as a Panel, we thought it prudent to make some comments about the review process itself. We believe this to be timely because the nature and makeup of the Panel, as well as the purpose and objectives of the review, will likely change in the future. We offer several observations and suggestions concerning the review process that we believe will strengthen and improve the reviews.

Observation 1: There has been a discouraging trend over the years towards review workshops where topics and viewpoints appear to be limited to the same few presenters, covering the same few topics (including large amounts of historical perspective), with too much of the review devoted to listening to the same materials the Panel and others have read. In the immortal words of Yogi Berra, the meetings have become increasingly "Déjà vu all over again". This approach leaves precious little time at the review meetings for the Panel to interact directly with, and question, the presenters and to hear from the audience.

Suggestion 1: The review process must be as transparent as possible. All possible viewpoints are critical to the evaluation of the EWA. The Panel needs to hear the widest possible viewpoints on EWA science and policy during the review meeting. Towards this end, the Panel is discouraged by the increasing trend of limited inclusion of non-agency stakeholder analysts at the review meetings. In our experience, the stakeholders offer alternative perspectives that are valuable to the review process.

Observation 2. The review meeting and preparing the Panel for the review could be more effective. We have found through time that the question and answer sessions often 'cut to the chase' and lead to discussions and insights not possible to glean directly from the written materials or the presentations. The Panel has also received information and materials after the review meeting that are highly relevant to the review. Receiving these materials after the meeting complicates the review because it is very difficult for the Panel to thoroughly discuss these materials with each other and the stakeholders once the review meeting is over. The Panel believes this broad source of input is vital to an effective review.

Suggestion 2a: To address these issues, the Lead Scientist should consider a more extensive level of dialog with the Panel prior to the review. The Panel should be briefed prior to the meeting on any developments they may not be aware of that are especially relevant to an approaching EWA review. The Lead Scientist should make an effort to make sure that all review materials are forwarded to the Panel in advance of the review meeting, or at the latest offered during the review. Presenters should recognize that the Panel has read written materials and build their presentation around emphasizing key points, rather than regurgitating the written materials. Presenters should also try to write the review materials in a way that highlights the progress and new developments that have occurred between review meetings.

Suggestion 2b: It would be useful for the Panel to have more input into developing the agenda and the timing of future review meetings. The Panel has been asked for comments on the review charge and the agenda and been able to offer some limited input. The Panel would like to see the development of the agenda and the Panel's charge should become an iterative process between the Panel and the Lead Scientist. In the case of a new Panel, it may be difficult for Panel

members to comment on a detailed agenda. Nevertheless, input from the Panel into developing the agenda and timing of future review meetings would serve two purposes. Increased input from the Panel would allow for more substance to be discussed at the review meeting, and would increase the transparency of the review process.

Observation 3: With past reviews by this Panel, the Lead Scientist has provided written feedback to the Panel after receiving the written EWA review report. The Panel recognizes that we may miss something or simply misinterpret some part of the review materials. This feedback has been useful to the Panel so that we know if there are details of which we may not be aware or where we are simply "missing the point".

Suggestion 3: Written feedback from the Lead Scientist should continue and become a formal part of the review process.

Observation 4: It is the Panel's perspective that our effectiveness has decreased over the last few years because of the lack of progress on key science issues related to the EWA. The Panel believes that without an influx of resources for addressing the research needs of EWA the annual reviews will become more and more redundant and less effective. The Panel recognizes that part of the problem is the "scramble" required by the agencies to participate in annual reviews. By the time one review is completed and digested, it is time to begin preparing for the next one with limited time to address issues raised in the previous review.

Suggestion 4: When EWA was an 'experiment', annual reviews were appropriate. Now that EWA is moving toward a long-term status a revised review process and schedule should be considered. Once the review of the current long-term planning needs are met, reviews should take place at two-year intervals to provide greater time for making progress in meeting the science objectives of the EWA. This will also reduce the " Déjà vu" effect for the Panel and all those participating in the review process. In off years, input from Panel members can be garnered through participation in special workshops or an annual EWA technical (not review) workshop.

Observation 5: After four years of review, the Panel notes that it is still unsure of the role that the CALFED Sciences Advisors are expected to play in the EWA and the Science Program, and in the processes of both science direction and science evaluation. Moreover, we perceive that many of the EWA participants are unsure of these relationships as well, which has, in our opinion, lead to what is increasingly viewed as a contentious relationship among the Advisors, agency participants, and stakeholders.

Suggestion 5: We suggest that the charge of the Sciences Advisors should be well defined within the context of the CALFED Science Program. The degree to which the Science Advisors are allowed to offer independent evaluation and analysis of data associated with EWA actions or science needs should be clearly stated.

Summary and Concluding Remarks

This report is the review Panel's fourth annual evaluation of the EWA. The Panel cautions readers of this report to be aware that many of the recommendations and topics of concern made in the previous three Panel review reports, not repeated here, remain highly relevant to EWA operations in 2004 and beyond.

Many positive findings were noted for 2004: (1) EWA continues to provide a high level of water supply reliability while protecting fish, (2) there has been a continued high level of cooperation among agencies and stakeholder in supporting the EWA concept, (3) acquisition of water continues to be an effective element of EWA operations, (4) the progress and evolution of EWA has been well documented through many agency reports, meetings, and workshops (5) communication and coordination among the EWA team and their decision making has resulted in timely and reasonable decisions, (6) several key areas of EWA science has evolved to yield new hypotheses and better management of at-risk fish species, (7) the integration and communication among environmental water programs has increased, (8) the potential integration of the IEP and CBDA Science program is a positive step, (9) the use of gaming and exercises has evolved in a positive way as a sound basis for determining the feasibility of EWA actions, (10) the release of a new Science PSP is positive and will inject new science into the EWA process, and (11) the scientific understanding of Delta smelt biology has made significant progress in the last four years and has provided a better basis for managing Delta smelt based upon their biology rather than take.

As the EWA evolves from an 'experiment' to a formal long-term program many science issues continue to need attention if EWA is to be managed with a sound scientific basis, and to assure that EWA assets are efficiently and effectively used in conjunction with other environmental water assets. The Panel recommends that a systematic approach to program integration be considered. Programs with similar goals such as the ERP and EWA or that may overlap in their roles such as EWA, EWP and the CVPIA Water Acquisition Program should be reviewed and a strategy for developing a synergy among these programs and their goals considered. We suggest focusing on integration to achieve synergistic biological benefits, rather than on other aspects of the programs such as personnel or finances.

The EWA should fully consider the biological consequences of their water purchases. Movement and deployment of EWA assets may have consequences for listed species, and these

consequences should be incorporated and justified as part of decisions to manipulate and deploy water assets within the system.

With EWA moving from a 4-year experiment to long-term operation, the Panel believes that the scrutiny of EWA science and water management practices will be heightened. The science and management rationale for use of EWA assets and the future costs and benefits for at-risk species should be documented.

<u>The EWA implementation process can be improved and the Panel offers three recommendations towards that goal</u>.

(1) The use of gaming has been a powerful tool for the EWA and the Panel anticipates a continued reliance on gaming for addressing many future issues. The Panel suggests caution in the interpretation and use of gaming results.

- The Panel suggests that future gaming include more biological information and explicit treatment of uncertainty. Implementation of these recommendations will increase the power and utility of future gaming exercises.

(2) The Panel believes that extreme care must be used to document and clearly describe gaming exercises to ensure models are being used appropriately to address specific questions.

- The Panel recommends that EWA carefully document gaming analyses and consider the use of population models and models of fish movement, in conjunction with water resource models, to broaden the interpretation and utility of the gaming. The Panel also recommends that the stochasticity and uncertainty be considered in the application of these models and that the results be peer reviewed to assure proper use and interpretation of results.

(3) The Panel has been frustrated with the lack of progress in enacting measures to increase new research efforts in support of the EWA, but the Panel sees the possibility of light at the end of the tunnel with the new Science Program proposal solicitations.

- The Panel suggests the CBDA consider implementing an additional small program to complement the larger PSPs to help build a bridge between academic and stakeholder researchers and agency scientists. This small program would provide seed money to develop research proposals, and would require collaborations between agency and non-agency research scientists as a criteria for funding. These proposals would provide a stimulus to developing new projects focused on topics relevant to management needs, while strengthening the options for managers to access resources outside of their agencies.

The EWA review process can be improved and the Panel offers five recommendations towards that goal.

(1) The review meetings and presentations have become somewhat redundant and less useful than they could be.

- Credibility of the Panel and the review requires that the annual EWA review be as transparent as possible. The Panel recommends a format that encourages more stakeholder participation.

(2) The Panel believes that the preparation of the Panel for the review could be more effective.

- The Panel recommends a more extensive dialog between the Panel and Science Program on the details of the agenda prior to the annual review meeting. We also suggest that more rigorous guidelines be adopted for presenters at the meeting so that the review is focused and presentations are not simply a review of written materials. We also recommend that Q&A time be emphasized in planning the agenda.

(3) The Lead scientist has provided a written response to Panel's comments in the past.

- The Panel suggests this practice be a formal part of the review process.

(4) The Panel's effectiveness is diminished if progress on key issues is limited between annual reviews.

- The Panel recommends that once the long-term EWA is in place a biennial (every other year) review be considered to allow the program time to make significant progress on key issues.

(5) The role of the science advisors is poorly defined within the EWA science program and this has ambiguity concerning their role in the science process and reduces the effectiveness of having science advisors.

- The Panel suggests the role of the science advisors be well defined within the context of the CALFED Science Program and that their responsibilities be clearly outlined.

Reference

Van Rheenen, N.T., A.W. Wood, R.N. Palmer, and D.P. Lettenmaier (2004), "Potential implications of PCM climate change scenarios for Sacramento-San Joaquin river basin hydrology and water resource,"*Climatic Change* **62:** 257-281.

Appendix 1. EWA Review Panel 2004

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